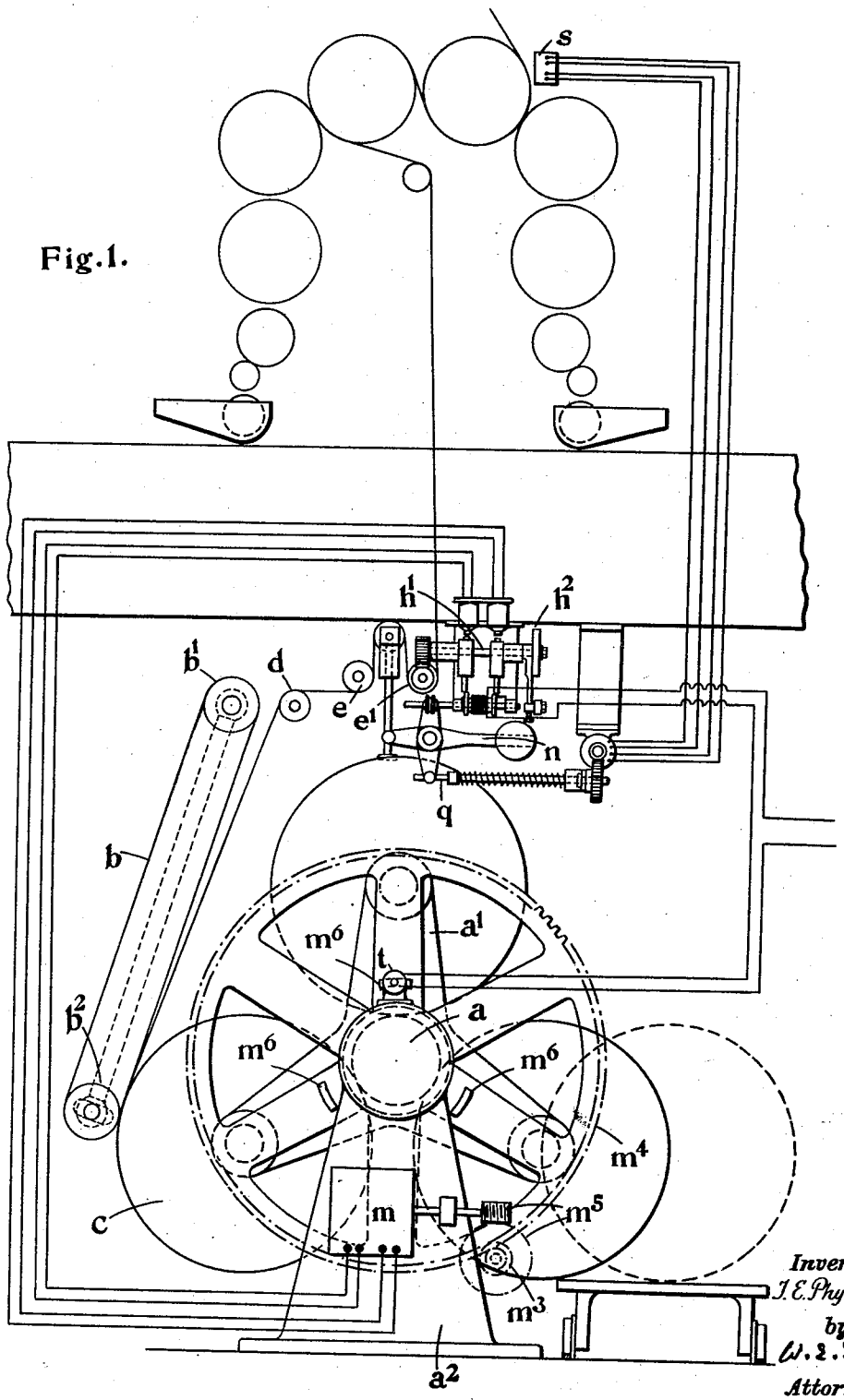
Aug. 2, 1932. T. E. PHYTHIAN 1,869,614

WEB TENSIONING APPARATUS

Filed Jan. 10, 1930 3 Sheets-Sheet 1

Fig.1.



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WEB TENSIONING APPARATUS

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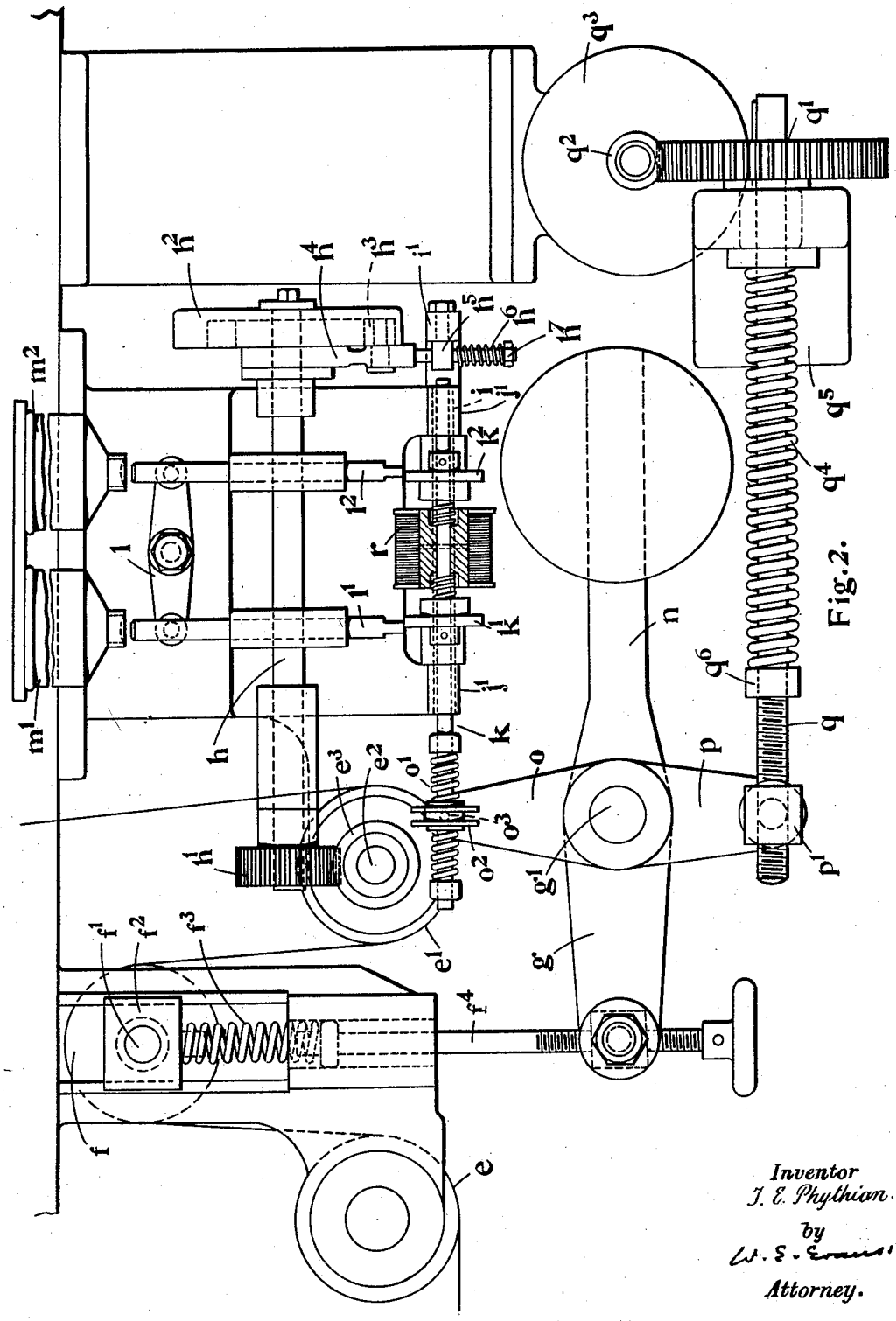


Fig. 2.

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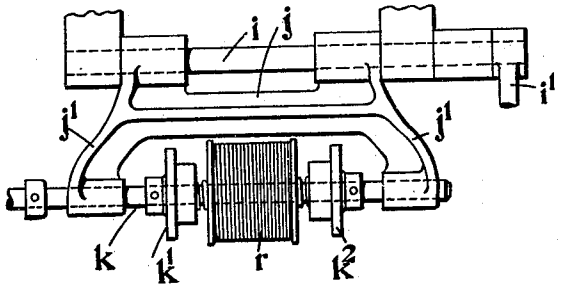


Fig.3.

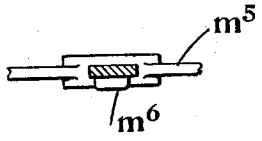


Fig.4.

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UNITED STATES PATENT OFFICE

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WEB TENSIONING APPARATUS

Application filed January 10, 1930, Serial No. 419,959, and in Great Britain January 19, 1929.

This invention relates to web tensioning apparatus specially applicable for the feeding of a web from a roll stand magazine to a rotary printing press.

The roll stand magazine is usually driven by a motor under remote control. It is, however, well-known that as a roll or reel of paper decreases in diameter the normal tension necessary must be obtained by a reduction of the braking effort and that this braking effort should be reduced at the same rate as the reduction of the diameter of the roll or reel. It is therefore desirable that this operation should be automatically performed.

The invention has accordingly for one of its objects to effect the automatic variation of the braking effort or resistance to unreeling of the web as the diameter of the roll or reel is reduced.

According to the invention, moreover, selective mechanism is employed which is adapted intermittently to operate push button switches or the like whereby the motor is operated by which the roll stand magazine is moved in one direction or the other according to the tension of the web.

According to the invention, moreover, means are provided such for example as an endless belt whereby the web tension is varied on the operation of the selective mechanism in the manner described.

According to the invention, moreover, means are provided for the manual control of the amount of normal tension on the web in addition to the automatic control in the manner described.

The invention comprises the features of construction and method hereinafter described.

A construction of web-tensioning apparatus according to the invention is illustrated, by way of example, in the accompanying diagrammatic drawings.

Figure 1 is a diagram in elevation of a plant in which the invention is shown applied.

Figure 2 is a view in elevation, to an enlarged scale, of the selective mechanism.

Figure 3 is a detail plan view of the pivoted frame of the selective mechanism.

Figure 4 is a detail plan view in illustration of the cams provided for the control of the position of the roll carrier, as hereinafter described.

In carrying the invention into effect according to the construction illustrated in the accompanying diagrammatic drawings in its application, for example, to a three-roll stand magazine, the automatic mechanism may advantageously be set in position immediately over the roll stand magazine a and an endless belt b may be so set upon and between two pulleys b^1, b^2 one of which is conveniently disposed overhead that contact between the driven belt b and one of the rolls or reels c may take place on the underside or near the lower end of the driven belt b as the reel or roll c is raised in a clockwise direction, it being understood that the same reel c may move out of contact with the lower part or underside of the driven belt b on the movement of the roll stand frame in an anti-clockwise direction and that the movement of the roll or reel c may be effected automatically as hereinafter described from an electric motor in gear with the rotating frame of the roll stand. One of the pulleys b^1, b^2, advantageously b^2, is driven at a peripheral speed slightly less than that of the type cylinder, and the pulleys are so mounted that the belt may swing about the pulley b^1.

The web from the roll or reel c so disposed in a lower position at the rear of the roll stand passes upwardly into a position adjacent the underside of the endless driven belt b thence over a stationary guide roller d and thence over a pair of juxtaposed stationary guide rollers e, e^1 between which a movable tension roller f is set in a position above and adapted to move under the varying tension of the web upwardly or downwardly. Thus, the web passes under the first stationary guide roller e of the pair referred to, thence upwardly over the movable tension roller f and thence downwardly and under the second roller e^1 of the pair, the web thence passing upwardly or otherwise on its way to the first printing couple, it being understood that the web passes around the second roller e^1 of the pair of stationary rollers with a considerable amount of lap and ad-

vantageously over half or more than half the circumference of the roller.

The spindle f^1 of the tension roller f is adapted to be supported within sliding blocks or bearings f^2 at each end of the roller which are adapted to be supported beneath by vertically disposed helical springs f^3, the lower ends of the springs respectively being conveniently supported by vertically disposed rods f^4 the lower ends of which are screw-threaded, the respective rods being carried at the ends of arms g of symmetrical form and position near the ends of a transversely disposed spindle g^1 set conveniently adjacent or beneath the tension roller or beneath the second roller e^1 and which spindle by the means hereinafter described is adapted to be partly rotated by reason of the movement imparted to the tension roller f under the varying tension of the web and is also adapted to be adjusted on the operation of a motor, that is by the means hereinafter described for regulation of the tension of the web.

At the end of the spindle e^2 of the second guide roller e^1 a worm e^3 is mounted, adapted to engage with a worm wheel h^1 set upon the end of a transversely disposed spindle h carried in a bracket mounted upon the frame of the press and at whose opposite end a cam h^2 is mounted in whose cam groove a runner or roller h^3 is set that is carried by a forked arm h^4, the upper end or fork of which embraces a collar adjacent the cam and the lower end of which passes with clearance through a swivel block h^5 carried by an arm i^1 secured to a spindle i rotatably mounted in the said bracket. A spring h^6 is confined between the block h^5 and a nut h^7 at the lower extremity of the arm h^4. A frame j comprises two rearwardly extending bosses in alignment, by which the frame is secured upon the spindle i, and two symmetrical outwardly extending arms j^1 carrying at their ends bearing bosses in alignment by which a control spindle k is carried. On this spindle two runners or discs k^1, k^2 having flat peripheries are mounted in determined positions and so spaced apart that one half of the width of each lies normally in contact with the lower ends respectively of a corresponding pair of vertically disposed plungers l^1 l^2 suitably carried in bosses mounted upon the bracket by which the worm wheel h^1 and cam spindle h are carried or upon some other stationary part, the respective pairs of plungers being connected at their upper ends by means of a lever l pivoted in a central position. The pair of plungers referred to have mounted over them a pair of push button switches m^1, m^2 which are connected through the usual starter to the motor m driving the roll stand magazine through a pinion m^3 and gear wheel m^4, the operation being such that on the lateral displacement of the runners or discs referred to one plunger does not make contact with the periphery of the corresponding runner or disc and on the upward movement of the pivoted frame the other plunger of the pair is caused to rise and by reason of the lever connection the plunger first referred to moves downward. In this way one or the other of the pair of push button switches is actuated. It will be understood that in the normal position of the control spindle in which both runners or discs k^1, k^2 are in contact with the plungers l^1, l^2, the lever l prevents the rise of the control spindle and the upward movement of the formed arm h^4 serves merely to compress the spring h^6.

It will be understood that the downwardly extending rods f^4 by which the movable tension roller f is supported in the manner hereinbefore described are respectively provided with adjusting screws or nuts by which connection is made with the automatically operated mechanism and by which the relation of the respective rods in the arms by which they are carried may be adjusted. The arms g last referred to are normally horizontally disposed and are extended beyond the spindle carrying them or an arm or arms n provided in opposite position which may be weighted. The spindle g^1, however, is provided with a normally upstanding arm o and a normally depending arm or lever p. The upstanding arm o is so provided that its upper end is disposed near the end of the cam actuated control spindle k carried by the pivoted frame j in such manner that the spindle k may have movement imparted to it from the arm by means of a connection which is advantageously an elastic connection, as, for example, by the use of opposed helical springs o^1 mounted near the end of the spindle k, the opposed springs abutting against a member o^2 having an annular channel or groove in which is received a pin o^3 carried by the upstanding arm o. The depending arm p mounted upon the spindle g^1 is connected at its lower end to a swivel nut p^1 in which is carried a screw-threaded spindle q on the opposite end of which a worm wheel q^1 is mounted which is driven by a worm q^2 from a small electric motor q^3. A helical spring q^4 is mounted upon the spindle q between a support q^5 for the spindle adjacent the worm wheel and a nut or collar q^6 mounted upon the spindle so that thus the spindle is normally thrust outwards towards the arm p.

It will be understood that the rolls or reels of paper are carried as is usual by and between symmetrical frame parts a^1 carried by supporting frames or standards a^2 at each end and that movement is imparted to the rotating frame thus constituted from the automatically operated motor m as hereinbefore described, advantageously through a worm and worm wheel drive m^5.

On the cam operated spindle k a solenoid or magnet r is mounted and helical springs are advantageously provided between the bosses of the respective runners or discs k^1, k^2 which are set on the spindle at each side of the solenoid or magnet r.

It will be understood that in the operation of the mechanism, should the tension on the web be so great that the tension roller f is brought to a lower position than the normal, the movement of the arm or arms g connected to the respective rods f^4 disposed beneath the sliding blocks or bearings f^1 of the tension roller takes place in a downward direction against the counter-weighted arms n, while the upstanding arm o connected to the cam operated control spindle k moves in an anti-clockwise direction and carries the spindle k to the left by which the runners or discs k^1, k^2 are also moved to the left. This movement brings the lefthand runner or disc k^1 fully under its plunger l^1 and the right-hand runner or disc k^2 completely away from its plunger l^2. Thus, the upward movement of the pivoted frame j which is now possible on the operation of the cam h^2 will cause the left-hand runner or disc k^1 to transmit movement to the left-hand plunger l^1 the upper end of which causes the operation of the corresponding push button switch m^1 by which the circuit to the motor m is closed through the usual starter, it being understood that connection is so made that the motor rotates in such a direction that the roll stand frame a^1 rotates in a forward or anti-clockwise direction. By this movement contact between the roll or reel c and the driven belt b is effected at such a position that the tension is decreased to such an extent that the tension roller f may resume its normal position.

Should the tension on the web, however, not be sufficient to allow the tension roller f to maintain its normal position, opposite movements to those described are secured and an upward movement imparted to the right-hand plunger l^2 instead of to the left-hand plunger l^1 by which contact is made with a push button switch m^2 for reverse movement of the roll stand frame a^1, the switch closing the circuit to the motor m and through the usual starter, the connections being so made that the motor rotates in such direction that the roll stand frame rotates in a clockwise direction. In this reverse movement the position of contact between the roll or reel and the driven belt is brought so much nearer to the point of suspension of the belt b that the braking effort is increased and the tension of the web brought to normal whereby the tension roller f may then resume its normal position.

It will be understood that the driven belt being of a determined weight greater effort will be necessary to support it at a position nearer to the axis of suspension than would be required at a position further away.

A push button switch s is advantageously provided for remote control, through the usual starter, of the circuit of the small motor q^3 hereinbefore referred to by which longitudinal movement is imparted to the screw-threaded spindle q through the worm q^1 and the worm wheel q^2 whereby the compression of the helical control spring q^4 mounted upon the spindle is either increased or decreased. By such means the tension of the spring f^3 supporting the tension roller f may be varied or regulated, should the normal tension of the web require variations, as, for example, by reason of the use of a different thickness, weight or quality of paper.

A cam plate m^6 corresponding to each roll or reel may be attached to the large gear wheel m^4 of the roll stand frame a^1 in such position that at the loading station the necessary height of the reel spindle carrier is obtained when contact is made by the corresponding cam plate with a push button device t connected in the circuit with the solenoid or magnet r hereinbefore referred to, this push button device also being thus connected to the mains and to the solenoid or magnet. On the circuit being closed the solenoid or magnet is energized so that each of the runners or discs k^1, k^2, is attracted and thus in that position of the runners or discs k^1, k^2 they are out of alignment with the respective plungers l^1, l^2 and thus on the upward movement of the pivoted frame j the circuit of the motor m is not closed for the operation of the reel or roll magazine.

It will furthermore be understood that the invention is not limited to the actual mechanism which is hereinbefore specifically described as the same effects and the same method of control may be carried out by other constructions of mechanism without departing from the invention.

I claim:

1. In a rotary web-printing press a roll stand magazine, an endless belt web-tensioning device, set to engage the supply roll in use on the roll stand magazine, a reversible motor for turning the roll stand magazine to control the web tension, a floating roller over which the web passes, positively operating switches for determining the operation and direction of rotation of the said motor, and a selective mechanism controlling the said switches, the said selective mechanism including a control spindle of adjustable position and a connection between said spindle and said floating roller, whereby said spindle is moved in response to movements of the floating roller.

2. In a rotary web-printing press, a roll stand magazine, an endless belt web-tensioning device set to engage the supply roll in use, on the roll stand magazine, a reversible mo-

tor for turning the roll stand to control the web tension, a pair of positively acting controlling switches for determining the operation and direction of rotation of the said motor, co-operating and oppositely movable plungers for controlling said switches, an oscillatable and longitudinally movable control spindle, plunger operating elements supported upon said control spindle, a web-driven cam oscillating the control spindle, a floating roller over which the web passes, and lever mechanism connected with the said roller and longitudinally moving the oscillatory spindle.

3. In a rotary web-printing press provided as set forth in claim 2, an oscillatable frame supporting the control spindle, a cam-operated element elastically connected with and oscillating said frame, parallel disposed switch controlling plungers, a lever pivotally mounted between said plungers and coupled therewith whereby said plungers are constrained for opposite movement, and plunger-operating elements mounted upon the control spindle and adapted to move one or the other of the plungers except in the mid position of the control spindle.

4. In a rotary web-printing press provided according to claim 2, a spindle transverse to the path of the web, arms upon said spindle carrying the floating roller, arms upon said spindle adapted to impart longitudinal movement to the control spindle, counter weight arms upon said spindle, and arms upon the said spindle to which is applied a force in opposition to the force supporting the floating roller.

5. In a rotary web-printing press, provided according to claim 2, means for supporting the floating roller comprising helical springs and supporting spindles, levers supporting said spindles about an axis transverse to the path of the web, an adjusting spindle for the said levers, a reversible electromotor adapted to actuate the said adjusting spindle, and switches controlling the said electromotor from a distance.

6. In a rotary web-printing press, a roll stand magazine comprising a fixed frame and a rotatable carrier with multiple axes for supply rolls, an endless belt web-tensioning device set to engage the supply roll in use, a reversible motor for operating the roll stand magazine to control the web-tension, a pair of positively acting controlling switches for determining the operation and direction of rotation of the said motor, co-operating and oppositely movable plungers for controlling said switches, an oscillatable and longitudinally movable control spindle, magnetically attractive plunger-operating elements slidably supported upon said control spindle, stops determining the normal position of the said plunger-operating elements, a solenoid upon said spindle to attract the said elements, springs upon the said spindle to act upon the said elements in opposition to the attraction of the solenoid, a web-driven cam to oscillate the control spindle, a floating roller over which the web passes, lever mechanism connected with the said roller and longitudinally moving the oscillatable spindle, a solenoid control switch upon the frame of the roll stand magazine, and switch-operating contacts corresponding to the roll axes provided upon the carrier of the roll stand magazine to operate said solenoid control switch.

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